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Ten pressure points in primary care during COVID-19: findings from an international narrative review

Sally Hall Dykgraaf^{1*}, Anne Parkinson², Michael Wright^{3,4}, William C. W. Wong⁵, Jane Desborough², Lauren Ball⁶, Elizabeth Sturgiss⁷, Garang M. Dut^{8,9}, Katelyn Barnes^{1,10}, Danielle Butler^{2,11}, Steph Davis^{2,12}, Kirsty Douglas^{1,10}, Candan Kendir¹³, Danielle Martin¹⁴, Robert Marten¹⁵, Katherine Rouleau¹⁴, Shannon Barkley¹⁶, Lucas de Toca¹² and Michael Kidd^{8,14,17,18}

Abstract

Background Strong primary care (PC) services are the foundation of high-performing health care systems and can support effective responses to public health emergencies. Primary care practitioners (PCPs) and PC services played crucial roles in supporting global health system responses to the COVID-19 pandemic. However, these contributions have come at a cost, impacting on PC services and affecting patient care. This secondary analysis of data from an integrative systematic review across international PC settings aimed to identify and describe burdens and challenges experienced by PCPs and PC services in the context of their contributions to COVID-19 pandemic responses.

Methods We conducted an integrative systematic review and narrative analysis, searching PubMed/Medline, Scopus, Proquest Central and Cochrane Database of Systematic Reviews, plus reference lists of key publications. Included studies were published in peer-reviewed English or Chinese language journals, and described collective responses to COVID-19 undertaken in PC settings or by PCPs. Narrative data regarding impacts on PC services and challenges experienced by PCPs were extracted and analysed using inductive coding and thematic analysis.

Results From 1745 screened papers 108, representing 90 countries, were included. Seventy-eight contained data on negative impacts, challenges or issues encountered in PC. Ten 'pressure points' affecting PC during COVID-19 were identified, clustered in four themes: demand to adopt new ways of working; pressure to respond to fluctuating community needs; strain on PC resources and systems; and ambiguity in interactions with the broader health and social care system.

Conclusions PCPs and PC services made critical functional contributions to health system responsiveness during the COVID-19 pandemic. However, both practitioners and PC settings were individually and collectively impacted during this period as a result of changing demands in the PC environment and the operational burden of additional requirements imposed on the sector, offering lessons for future pandemics. This study articulates ten empirically derived 'pressure points' that provide an initial understanding of burdens and demands imposed on the international primary care sector during the COVID-19 pandemic. The impact of these contributions should inform future pandemic planning, guided by involvement of PCPs in public health preparedness and policy design.

Keywords Primary care, Primary health care, Family practice, General practice, COVID-19 pandemic, Disaster planning

*Correspondence: Sally Hall Dykgraaf sally.hall@anu.edu.au Full list of author information is available at the end of the article



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Background

Primary care (PC) services, including family practice, operated at the clinical frontline of the global COVID-19 pandemic by providing accessible first-contact care in the community. Responses to emerging healthcare needs were often reactive and emergent, including examples such as mobile outreach testing in residential aged care settings and schools, remote home monitoring of unwell patients, vaccine administration, and management of postacute sequelae of COVID-19 (PASC) or Long COVID [1-3]. PC is an essential component of primary health care (PHC), along with multi-sectoral policy and action, engagement of empowered individuals and communities, and essential public functions [4], and a fundamental pillar of universal health coverage [5]. In this context, such PC activities were essential strategic functions that enabled rapid health sector adaptation and contributed to robust system-level responses to the evolving pandemic [6, 7].

Crucial PC responsibilities during COVID-19 included maintaining access to routine and essential health services, supporting COVID-19 surveillance and response, and promoting prevention and vaccination [8]. Internationally, a wide range of early studies described actual and potential roles for primary care practitioners (PCPs) in triage, assessment, treatment and ongoing monitoring of COVID-19 cases [1, 7, 9-11]. PCPs were also engaged in overcoming vaccine hesitancy, allocating essential resources and equipment, ensuring accessibility and affordability of care, undertaking planning and communication, transforming and adapting work processes and healthcare flows, responding to context-specific community needs, and supporting pandemic recovery [12-18]. These roles were undertaken while also responding to the dual challenge of providing continuing patient care under uncertain conditions, and ensuring staff and patient safety [18, 19]. They were also accompanied by mounting reports of service disruptions and delays in routine care, increased workload, reductions in income and economic sustainability, concerns about staff and patient safety [20], and limitations to communication, technology and governance structures [17].

Despite the importance of PC as the foundation of universal health care systems, and at the clinical frontline of the COVID-19 pandemic, there has been a relative mismatch between this "position on the ground" in supporting patients and public health (PH) responses to COVID-19, and research that synthesises collective accounts of the PC contribution [21].

Methods

This study aimed to identify and describe the operational and organisational challenges experienced by PCPs and PC services in the context of their policy and programlevel contributions to broader health system responses to the COVID-19 pandemic. It describes sub-analysis results from a systematic scoping review of PC contributions to national and sub-national responses to COVID-19 [22], and focuses on the impact of the pandemic as experienced in family practice and other PC settings.

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Systematic searches of PubMed/Medline, Scopus, Proquest Central and the Cochrane Database of Systematic Reviews were conducted for the period December 2019 to May 2021, as well as hand searching reference lists of relevant studies. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed [23]. See Tables 1 and 2 for search terms and inclusion/exclusion criteria.

Data were extracted from included studies by one of three reviewers (SH, AP, WW) using a standardised template. Study characteristics and PC roles were recorded, as well as results and outcomes attributed to these roles, and the difficulties and challenges encountered, reflecting the impact of the pandemic on PC (See Supplementary data, Appendix 1). Only data relating to the final section of the extraction tool focused on PC impact and challenges are reported in this paper. Data on PC roles were analysed independently and will be reported separately [22]. Narrative data were coded sequentially by two investigators (AP, SH) using NVivo software (QSR International, version 12, released 2018), in an iterative process consistent with Braun and Clarke's six-step approach to thematic analysis [24]. Data on impact were initially reviewed to re-familiarise analysts with the content and distinguish descriptions of issues, challenges and negative effects on primary care from claims about the results or outcomes of primary care roles. Challenges and issues encountered were then coded inductively using an open coding process to generate an extensive series of initial nodes encompassing the range of experiences described.

Table 1 Exemplar search string

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(COVID-19 OR SARS-CoV-2) AND ("primary care" OR "primary health care" OR "general practice" OR "family medicine" OR "family practice" OR "general practitioner" OR GP OR "family doctor" OR "general practicie" OR "family practice" OR "community health worker" OR "village health worker" OR "all health worker" OR "community health promoter" OR Promotore OR "allied health" OR "Primary Health Care" OR "Primary Care Physicians") AND ("national response" OR "policy response" OR "health system response" OR program OR "Health Policy" OR "Public Policy" OR "Community Health Planning" OR "Communicable disease control" OR "impact on" OR "role of" OR strategy)

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Table 2 Inclusion and exclusion criteria

Inclusion criteria

- Describes a collective COVID-19 related role (clinical care or health system activity) undertaken by primary care settings or providers; OR
- Describes a discrete policy, program or profession-based primary care response in at least one country at national, regional or other collective level.
- Primary care settings include family medicine / general practice; community nursing and allied health including pharmacy and dental/oral health, indigenous health workers; aged care and disability care services; and community-based maternal and child health services, and in some countries, community-based paediatrics and general internal medicine specialists.

Exclusion criteria

- Not written in English, Chinese, French, Spanish, Portuguese or Setswana.
- Describes only individual practice-level initiatives or activity.
- Describes only speculative roles, guidance or recommendations rather than actual events, activity or implementation

Subsequently, using axial coding, these nodes were examined and reviewed to refine content and explore relationships between nodes. Nodes were then clustered and categorised to capture common elements and differentiate concepts, with classifications and emerging relationships reviewed and discussed by two reviewers. Categories were progressively reviewed using a best-fit approach to identify and refine emergent themes.

Data

All data relating to this analysis are presented within the manuscript or as supplementary files.

Results

Included in this analysis are 78 of 108 papers included in the broader review of PC roles which will be reported separately [22]. See Fig. 1 for the PRISMA flowchart.

These 78/108 (72.2%) papers yielded data regarding impacts, challenges or issues faced by PCPs and settings (see Table 3, Additional File). The remaining 30 papers did not report data describing these issues. We identified ten thematic 'pressure points' that encapsulate the challenges experienced by PCPs internationally during the first 18 months of the COVID-19 pandemic. Thematically, these clustered in four broad categories of impact (see Table 4).

Demand for new ways of working Rapid adaptation in a high-pressure environment

A significant challenge for PCPs was the repeated, unrelenting pressure to adapt in real time to a fast-changing pandemic context. This was particularly evident in the immediate demand for rapid transition to virtual consultations in order to minimise COVID-19 transmission [11, 25, 28, 33, 44, 46, 51, 58, 59, 61, 66, 70, 71, 82, 84, 92, 100], while education and training in effective and efficient use of digital modalities remained an identified gap in many countries (see Table 5) [32, 33, 51, 58, 70, 82,

84, 100]. Balancing operational efficiency, PH directives, and staff safety was often difficult, requiring open and transparent communication between management and staff, and coordination of change management processes, simultaneously with accelerated implementation in Canada [32]. While new and innovative modes of care, such as electronic prescribing and medication delivery, were often established, they also required adaptation to new workflows for pharmacists, clinicians, and delivery drivers as well as coordination between pharmacies, primary care, postal and other community services (for example in Qatar and South Africa) [25, 38].

Radical adoption of infection prevention and control (IPC) measures

While the necessity to prioritise IPC was broadly recognised, greater knowledge about preventive measures and handling suspected cases of COVID-19 was needed [73, 76, 90, 93], especially the correct use of personal and protective equipment (PPE) [30, 92]. Instigating measures to isolate and segregate patients within clinical spaces proved challenging [78, 89], especially managing patients who did not complete required pre-screening activities, creating concerns about staff safety in Australia [20]. Asymptomatic and non-specific illness presentations made COVID-19 differentiation difficult [83, 91], while reliance on non-clinical telephone and online triage raised concerns about patient safety, correct diagnosis and recognition of disease severity and progression in the UK [52]. Lack of appropriate PPE was particularly challenging, especially early in the pandemic when regular supply chains were disrupted [20, 30, 32, 35, 39, 42, 44, 47, 48, 50, 54, 57, 67, 68, 73–76, 78, 82, 84, 86, 89, 92–96, 100]. Some PCPs sourced PPE at their own personal cost (Greece) [89], or made their own (China) [93].

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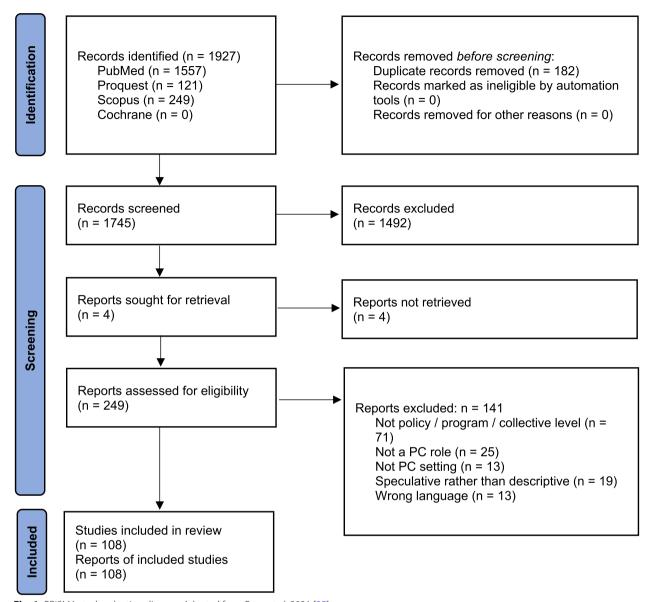


Fig. 1 PRISMA study selection diagram Adapted from Page et al. 2021 [25]

Fluctuating community needs

Maintaining routine and preventive care

Access to routine non-COVID-19 related PHC services was radically curtailed due to the imposition of PH restrictions on movement and social activity [20, 29, 36, 41, 44, 54, 56, 63, 66, 68, 76, 80, 82, 83, 86–89, 97, 98]. Some patients delayed seeking care due to fear of infection [20, 54, 83], including for childhood immunisations (Qatar) [29], generating concern about increased population burden of non-COVID related illness in both the immediate and longer term. The repercussions of reductions in routine care included potentially delayed diagnoses [20, 36, 68], reduced continuity of care [86], lack

of chronic disease management [54, 89, 97, 98], lack of preventive care and screening programs [29, 88], reduced access to child and maternal care [87], and neglect of conditions such as malaria and tuberculosis in some African countries [83, 87].

Exacerbation of social determinants of health

The pandemic severely exacerbated the effect of social determinants of health, compounding negative impacts for people of low socioeconomic status (SES) [26, 37, 42, 68, 77, 87], racial and ethnic minorities [27, 85], opioid drug users [40, 54], released offenders [81], and people living in rural areas [33, 69]. In some countries, the

Table 3 Summary of included studies, n = 78

Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Adepoju 2021 [26]	County-Level Determinants of COVID-19 Testing and Cases: Are there Racial/Ethnic Disparities in Texas?	Oct-21	USA	USA - Texas	Researcher	To explore relation- ships between eth- nicity and COVID-19 testing and case rates at the county level	Observational - quanti- tative analysis	General practice / family medicine
Al Ghafri 2021 [27]	Responses to the Pandemic COVID-19 in Primary Health Care in Oman: Muscat Experience	Jan-21	Oman	Oman - Muscat	Policy maker	Summarise trends in COVID-19 incidence and describe related responses in PHC settings	Observational - narrative description only	Other: PHC broadly, including PC
Alavi 2021 [28]	Implementing COVID-19 Mitigation in the Community Mental Health Setting: March 2020 and Lessons Learned	Jul-20	USA	USA; Michigan	Other: Researchers, clinicians, service delivery org	Describe and share COVID-19 mitigation and service delivery alteration plan developed collaboratively in one regional service delivery organisation operating across 21 counties	Observational - narrative description only	Other: Community mental health service providers operating as one of 10 geographi- cally defined prepaid inpatient health plans in mid-state Michigan
Al-Kuwari 2021 [29]	The impact of COVID- 19 pandemic on the preventive services in Qatar	Jan-21	Qatar	Qatar	Other: Researchers and service delivery organisation	Measure the impact of COVID-19 on preventive services provided in Qatar	Observational - quanti- tative analysis	General practice / family medicine
Alsnes 2020 [30]	How well did Norwegian general practice prepare to address the COVID-19 pandemic?	Dec-20	Dec-20 Norway	Norway	Researcher	Describe "qual- ity improvement" approaches and adap- tations of Norwegian general practice in the first stages of the COVID-19 pandemic	Observational - narrative description only	General practice / family medicine
Al-Tawfiq 2021 [31]	COVID-19 home monitoring program: Healthcare innovation in developing, maintaining, and impacting the outcome of SARS-CoV-2 infected patients	Jun-21	Saudi Arabia	Saudi Arabia	PC practitioner/clini- cian	Describe characteristics and outcomes of COVID-19 patients monitored at home between June & October 2020.	Observational - quantitative analysis	Other. Not specified - multiple disciplines potentially involved

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Study ID	litte	Date	Country	Jurisaiction	Author perspective	Aim of study / paper	study design	P.C. setting
Al-Zaidan 2021 [25]	Qatar's Primary Health Care Medication Home Delivery Service: A Response Toward COVID-19	Mar-21	Qatar	Qatar	NGO / service delivery organisation	Describe and assess development and implementation of Primary Health Care Corporation (PHCC) Medication Home Delivery service	Observational - narrative description only	Community pharmacy
Ashcroft 2021(a) [32]	The delivery of patient Nov-21 care in Ontario's family health teams during the first wave of the COVID-19 pandemic	Nov-21	Canada	Canada; Ontario	Researcher	Identify continuations and changes in care delivery methods in primary care teams during the first wave of the COVID-19 pandemic in Ontario.	Observational - mixed methods analysis	Other: Specific teambased primary care models (Family Health Teams, Community Health Centres, Nurse Practitioner-Led Clinics), auspiced at the jurisdictional level
Ashcroft 2021(b) [33]	Primary care team experiences of delivering mental health care during the COVID-19 pandemic: a qualitative study	Jul-21	Canada	Canada, Ontario	PC practitioner/clini- cian	To describe the impact of the COVID-19 pandemic on primary care teams delivery of mental health care in Ontario	Observational - qualitative analysis	General practice / family medicine
Baltrus 2021 [34]	Percentage of black population and primary care shortage areas associated with higher COVID-19 case and death rates in Georgia counties	Feb-21	USA	USA; Georgia	Researcher	Test hypotheses that COVID-19 cases and mortality would be associated with race / ethnicity and with access to PC	Observational - quantitative analysis	Other; not specified
Barzin 2020 [35]	Development and Implementation of a COVID-19 Respira- tory Diagnostic Center	Apr-20	USA	USA, North Carolina	NGO / service delivery organisation	Description of the development and implementation of a COVID-19 respiratory diagnostic centre	Commentary / edito- rial	General practice / family medicine
Baum 2021 [36]	Chronic Care Management Dur- ing the COVID-19 Pandemic	Apr-21	USA	USA	Researcher	Review early empirical evidence on changes to chronic care delivery during the pandemic	Observational - narra- tive description only	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Bhatti 2020 [37]	A rapid primary healthcare response to COVID-19: An equity-based and systems-thinking approach to care ensuring that no one is left behind	Nov-20	Nov-20 Canada	Canada; Ontario	NGO / service delivery organisation	Describe how members of the Alliance for Health Communities (comprehensive, salary-based PC organisations) have addressed the needs of their communities during the COVID-19 pandemic.	Observational - qualitative analysis	Other: rage of community-governed community-based primary health care organisations
Brey 2020 [38]	Home delivery of med- Jun-20 ication during Coronavirus disease 2019, Cape Town, South Africa: Short report	Jun-20	South Africa	South Africa: Cape Town	NGO / service delivery organisation	Program description	Observational - narrative description only	Community health workers
Chamboredon 2020 [39]	COVID-19 pandemic in France: health emer- gency experiences from the field	Jun-20	France	France	Other: Clinician and researcher	Description of the response to COVID-19 in France as of early May 2020, the main policies implemented, and the roles and responsibilities of nurses.	Observational - narrative description only	General practice / family medicine
Copp 2021 [20]	COVID-19 challenges faced by general practitioners in Aus- tralia: a survey study conducted in March 2021	Sep-21	Australia	Australia	Researcher	Investigate COVID- 19 challenges and support needs in general practice 1 year after pandemic was declared	Observational - mixed methods analysis	General practice / family medicine
Crowley 2020 [40]	A national model of remote care for assessing and providing opioid agonist treatment during the COVID-19 pandemic: a report	Jul-20	Ireland	Ireland	PC practitioner/clinician	Describe a national model of remote treatment for opioid agonist treatment (OAT) in response to COVID-19	Observational - narrative description only	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Dambha-Miller 2021 [41]	Primary care consultations for respiratory tract symptoms during the COVID-19 pandemic: a cohort study including 70,000 people in South West England	Oct-21	England	UK; southern England	Researcher	Examine volume and type of PC consultations for respiratory symptoms during the first wave of the COVID-19 pandemic in the UK	Observational - quanti- tative analysis	General practice / family medicine
David 2020 [42]	Community-based screening and testing for Coronavirus in Cape Town, South Africa: Short report	Jun-20	Jun-20 South Africa	South Affica, Cape Town	Describe the community based screening and testing program developed in Cape Town	Commentary / edito- rial	Other: General practice and CHWs	Other: General practice Other: General practice and CHWs
Davis 2021 [43]	Integrating General Practice into the Aus- tralian COVID-19 response: A descrip- tion of the GP Res- piratory Clinic program in Australia	Nov-21	Nov-21 Australia	Australia	Policy maker	Describe establishment and implementation of Australia's GP Respiratory Clinic Program	Observational - narrative description only	General practice / family medicine
Desborough 2020 [11]	Australia's national COVID-19 primary care response	Aug-20	Aug-20 Australia	Australia	Policy maker	Describe Australia's primary care response	Observational - narrative description only	Other: Broad primary care
Desborough 2021 [44]	Reflecting on Australia's five principles for pandemic response in primary care through the lens of early international experiences of COVID-19	Feb-21	Feb-21 Australia	Australia	Researcher	Examine 5 principles for PC response to the pandemic against 6 challenges identified in the literature	Observational - qualitative analysis	Other: Broad PC
Donnelly 2021 [45]	Interprofessional primary care during COVID-19: a survey of the provider perspective	Feb-21	Feb-21 Canada	Canada; Ontario	Researcher	Describe the state of interprofessional health provider practice within interprofessional PC teams during the COVID-19 pandemic	Observational - mixed methods analysis	Other: Non-physician members of interprofes- sional PC teams

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Driver 2021 [46]	Front-Line innovation: Rapid implementation of a nurse-driven pro- tocol for care of outpa- tients with COVID-19	Jan-21	USA	USA, Boston	Other: Researchers and clinicians	To rapidly adapt and scale a registered nurse-driven Coordinated Transitional Care (C-TraC) programme to provide intensive home monitoring and optimise care for outpatient Veterans with COVID-19 in a large urban Unites States healthcare system	Observational – descriptive pre/post quality improvement	Other: Researchers and clinicians
Duckett 2020 [47]	What should primary care look like after the COVID-19 pandemic?	May-20	Australia	Australia	Researcher	Describe Australia's response to COVID pandemic and lessons for the future	Commentary / edito- rial	Other: General practice and community health
Eisele 2021 [48]	Strategies in Primary Care to Face the SARS- CoV-2 / COVID-19 Pandemic: An Online Survey	Jun-21	Germany	Germany	Researcher	Investigate challenges faced and solutions implemented in primary care during the COVID-19 pandemic	Observational - qualitative analysis	General practice / family medicine
Evans 2021 [49]	Nurses take the lead in the biggest vaccine roll-out in UK history: As the programme extends further across primary care, teams will need more support, say front-line staff	Jan-21	ž	UK (country not speci- fied)	Other: Journalist / reporter	Commentary / edito-rial	General practice / fam- ily medicine	General practice / family medicine
Farsalinos [50] 2021	Improved strategies to counter the COVID- 19 pandemic: Lockdowns vs. primary and community healthcare	Dec-20	Greece	Greece	Researcher	Description of pandemic response in Greece	Commentary / edito-rial	Other: primary and community care

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Godfrey 2021 [51]	Factors associated with successful implementation of telehealth abortion in 4 United States clinical practice settings	Apr-21	USA	USA	Researcher	Describe factors that contributed to successful implementation of telehealth abortion in the US during COVID-19	Observational - qualitative analysis	General practice / family medicine
Goyal 2021 [52]	Restricted access to the NHS during the COVID-19 pandemic: Is it time to move away from the rationed clinical response?	Aug-21	ž	ž	Other: Researchers and clinicians	Examine NHS' restriction of access to healthcare during COVID-19	Commentary / edito- rial	General practice / family medicine
Harnden 2021 [53]	Lessons from the United Kingdom's COVID-19 vaccination strategy	Mar-21	ž	ž	Other: Researchers and members of the UK Joint Committee on Vaccination and Immunisation	Description of the UK vaccination strategy	Commentary / edito- rial	General practice / family medicine
Huston 2020 [54]	COVID-19 and primary care in six countries	Sep-20	Multiple	International	Researcher	Describe actions in primary care in response to COVID-19 in 6 countries : Australia, New Zealand, Canada, the Netherlands, UK, US	Commentary / edito-rial	General practice / family medicine
lacobucci 2021 (a) [55]	COVID-19: GPs can limit routine work to focus on vaccination, says NHS England	Jan-21	England	UK, England	Other: Medical jour- nalist	Describe impact of vax roll-out	Commentary / edito-rial	General practice / family medicine
lacobucci 2021 (b) [56]	COVID-19 vaccine: GPs should decide whether to honour second dose appoint- ments, says minister	Jan-21	Ä	All four UK nations	Other: Medical media	Reporting events	Other. No study	General practice / family medicine
Ismail 2021 [57]	Primary health care physicians' perspective on COVID-19 pan- demic management in Qatar: a web-based survey	Sep-21	Qatar	Qatar	Researcher	To assess PCPs satisfac- tion towards COVID-19 pandemic manage- ment in Qatar	Observational - quanti- tative analysis	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Jonnagaddala 2021 [58]	From telehealth to virtual primary care in Australia? A Rapid scoping review	Apr-21	Australia	Australia	Researcher	To examine informatics and digital health strategies that supported the primary care response to COVID-19 in Australia.	Review	General practice / family medicine
Joy 2020 [59]	Reorganisation of primary care for older adults during COVID-19: a cross-sectional database study in the UK	Aug-20 UK	ž	ک	Researcher	To assess the responsiveness and prioritisation of PC consultation type for older adults during the pandemic	Observational - quanti- tative analysis	General practice / family medicine
Kaseje 2021 [60]	Leveraging latent assets to strengthen the COVID-19 response and vaccine roll-out in África	May-21	Кепуа	Sub Saharan Africa, Siaya (rural Kenya)	Other. Researchers and NGO Surgical Sys- tems Research Group	To describe the implementation of an integrated intervention leveraging the community health strategy, youth, and digital technology to maximize COVID-19 prevention and optimize COVID-19 case management in communities and health facilities	Observational - narrative description only	Community health workers
Kim 2021 [61]	Communication and Cooperation Between the Medical Academy, Medical Association, and Local Government: Health Counseling Program After Recovery From Coronavirus Disease 2019 (COVID-19) in Daegu	Jan-21	South Korea	South Korea, Daegu	Researcher	To describe the creation of a counseling program for discharged COVID-19 patients and cooperation between the Family Medicine Academy, the Medical Assocand local govt.	Observational - narrative description only	General practice / family medicine
Koller 2021 [62]	Payer actions and primary care in the wake of COVID-19: Will primary care be there when we need it?	Apr-21	USA	USA	Researcher	Not stated - description of funding implications of COVID-19 impact on US PC?	Observational - narra- tive description only	General practice / family medicine

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Lahariya 2020 [63]	Health & Wellness Centers to Strengthen Primary Health Care in India: Concept, Progress and Ways Forward	Jul-20	India	India	Researcher	To document the key design aspects of Health and Wellness Centres, against core components of PHC & the health system functions	Observational - narrative description only	General practice / family medicine
Leslie 2021(a) [64]	Achieving Resilience in Primary Care during the COVID-19 Pandemic: Competing Visions and Lessons from Alberta	Nov-21	Canada	Canada; Alberta	Researcher	Describe competing visions of resilience in the response to COVID – 19 between Albert's central service delivery system and independent primary care providers.	Observational - narrative description only	Other: "Independent PC" seen as community based primary care providers plus primary care networks
Leslie 2021(b) [65]	A "Shock Test" to Primary Care Integration: COVID-19 Lessons from Alberta	Nov-21	Canada	Canada - Alberta	Policy maker	Draw out generalisable policy considerations from Alberta's PC integration model during COVID-19	Observational - narrative description only	General practice / family medicine
Li 2021 [66]	Primary health care response in the management of pandemics: Learnings from the COVID-19 pandemic	Sep-21	Multiple	Hog Kong, China and UK	PC practitioner/clini- cian	Describe COVID-19 response from primary care in 2 countries, and identify crucial learnings	Observational - narrative description only	General practice / family medicine
Liaw 2021 [67]	Primary Care Informatics Response to COVID-19 Pandemic: Adaptation, Progress, and Lessons from Four Countries with High ICT Development	Aug-21	Aug-21 Multiple	Australia, Canada, USA, UK	Researcher	To examine the use of PC Informatics and telehealth across the COVID-19 pandemic across four countries	Review	General practice / family medicine
Majeed 2021 [68]	Addressing COVID- 19 proactively through primary care in England's National Health Service	Apr-21	England	England	Policy maker	Not stated	Observational - narra- tive description only	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Marks 2021 [69]	Influenza Vaccination in Health Centers during the COVID-19 Pandemic-United States, November 7–27, 2020	Jul-21	USA	US	Other: CDC COVID-19 Response, Atlanta, Georgia Health Resources & Services Admin, Rock- ville, Maryland Nat Assoc of Com- munity Health Centers, Bethesda, Maryland	To assess disparities in influenza vaccina- tion at HRSA-funded health centers during the COVID-19 pandemic	Observational - quanti- tative analysis	General practice / family medicine
Murphy 2021 [70]	Implementation of remote consulting in UK primary care fol- lowing the COVID-19 pandemic: a mixed- methods longitudinal study	Feb-21	ž	ž	Researcher	To investigate the rapid implementation of remote consulting and explore impact over the initial months of the COVID-19 pandemic	Observational - mixed methods analysis	General practice / family medicine
Myers 2021 [71]	Flattening the Curve by Getting Ahead of It: How the VA Healthcare System Is Leveraging Telehealth to Provide Continued Access to Care for Rural Veterans: Official Journal of the American Rural Health Association and the National Rural Health Care Association	Apr-20	USA	USA	Other: Researchers and clinicians	To describe the VA's move to telehealth during the COVID-19 pandemic to continue providing usual care	Commentary / edito-rial	General practice / family medicine
Neves 2021 [72]	Virtual primary care in high-income countries during the COVID-19 pandemic. Policy responses and lessons for the future	Dec-21	Multiple	High income countries	Researcher	To explore the virtual care policies and guidance material published during the initial months of the pandemic and examine their potential limitations and impact on transforming the delivery of PC in high-income countries	Review	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Nie 2020 [73]	The Role of Family Physicians in the Con- trol and Prevention of COVID-19	Mar-20	China	China, Jinshan District, Shanghai	Health service manager / administrator	To discuss and summarize the deployment and role of family physicians in combating the epidemic	Observational - narrative description only	Other: Family doctors working in Zhujing Com- munity Health Center
Novak 2021 [74]	Pharmacists' role, work practices, and safety measures against COVID-19. A comparative study	Mar-21	Multiple	Croatia and Serbia	Researcher	To explore and compare the community pharmacists' roles, practices, implemented safety measures, and psychological toll in Croatia and Serbia during the COVID-19 pandemic	Observational - quanti- tative analysis	Observational - quanti- Community pharmacy tative analysis
OECD 2021 [6]	Strengthening the frontline: How pri- may health care helps health systems adapt during the COVID-19 pandemic	Feb-21	Multiple	Multiple countries	NGO / service delivery organisation	Policy brief describing impact of C-19 pandemic on people with chronic conditions and the essential role of PHC systems in response.	Observational - narrative description only	Other: PHC, especially team-based models and community-based services
Oh 2020 [75]	National Response to COVID-19 in the Republic of Korea and Lessons Learned for Other Countries	Apr-20	Korea	Korea	Researcher	To describe the main strategies under-taken in South Korea in response to COVID-19 to identify transferable lessons for other countries	Observational - narrative description only	Other: Both PHC and hospital care
Ohrling 2020 [76]	Management of the emergency response to the SARS-CoV-2 (COVID-19) outbreak in Stockholm, Sweden, and winter preparations	Sep-20	Sweden	Sweden; Stockholm	Other: Health services managers +research- ers	To describe response of a public primary/ community health org (Stockholm region) to demand for care for COVID-19 and non-COVID-19 patients March-July 2020, and summarise future preparations	Observational - narrative description only	Other: Primary and community healthcare (public non-acute) organisation including 'hospital at home', palliative care, primary care, psychiaty, addiction, rehab and community geriatric hospitals.
Oseni 2020 [77]	The role of the family physician in the fight against Coronavirus disease 2019 in Nigeria	Jun-20	Nigeria	Nigeria	PC practitioner/clini- cian	Not explicit - to recognise / describe role of family physicians in the fight against COVID-19	Observational - narrative description only	General practice / family medicine

Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Patel 2021 [78]	Safer primary healthcare facilities are needed to protect healthcare workers and maintain essential services: lessons learned from a multi- country COVID-19 emergency response initiative	May-21	Multiple	22 African countriles	Other: Clinicians, researchers, NGO	To describe the implementation of an emergency initiative for HCWs at the primary health facility level in 22 African countries. Between April 2020 and January 2021	Observational - narrative description only	General practice / family medicine
Pearce 2022 [79]	Responding to COVID- 19 with real-time general practice data in Australia	Oct-21	Australia	Australia	Other: Multiple	Not stated, describes POLAR data aggre- gation system and applied usage during COVID-19	Observational - narrative description only	General practice / family medicine
Waters 2021 [80]	Community health workers in the COVID-19 response and continuation of primary health care	Apr-21	Multiple	International; main examples from Liberia drawing on previous epidemic experience with Ebola and role of CHWs but also referenced in Bangladesh, Ethiopia, Brazil	Other: Unclear	Not stated. Describes potential roles and international exemplars during COVID-19 pandemic	Observational - narrative description only	Community health workers
Puglisi 2021 [81]	COVID-19 and primary Apr-21 care for incarcerated people released to the community	Apr-21	USA	USA	Other. Researcher and PC practitioner/ clinician	To describe the state of COVID-19 and primary care in US correctional facilities, de-carceration protocols related to the pandemic, and health care and public health systems adaptations related to COVID-19 for those affected by incarceration	Observational - qualitative analysis	Other: Correctional facility
Rajan 2021 [82]	What we can learn from European experi- ences of primary care under COVID-19	Apr-21	Multiple	UK and Europe	PC practitioner/clini- cian	To review what is known about changes in utilization of primary care in Europe and how providers of primary care have adapted to the new situation (COVID-19).	Observational - qualitative analysis	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Ray 2021 [83]	Innovation in primary health care responses to COVID-19 in Sub- Saharan Africa	May-21	Multiple	Sub-Saharan Affica	Researcher	To synthesise the lessons learnt from the COVID-19 pandemic in the Africa region	Other: thematic document analysis	General practice / family medicine
Ritchie 2021 [84]	COVID Challenges and Adaptations Among Home-Based Primary Care Practices: Lessons for an Ongo- ing Pandemic From a National Survey	Jun-21	USA	USA	Researcher	To describe the challenges and adaptations by Home Based Primary Care (HBPC) practices made during the first surge of the COVID-19 pandemic	Observational - mixed methods analysis	Other: Home based primary care
Romero 2020 [85]	Health Center Testing for SARS-CoV-2 During the COVID-19 Pandemic - United States, June 5-October 2, 2020	Dec-20	USA	Sn	Other: CDC COVID-19 Response Team Bureau of Primary Heath Care, Health Resources and Ser- vices Administration, Rockville, Maryland.	To assess health centers' capac- ity to reach racial and ethnic minority groups at increased risk for COVID-19 and to provide access to testing	Observational - quantitative analysis	
Saint-Lary 2020 [86]	How GPs adapted their practices and organisations at the beginning of COVID-19 outbreak: a French national observational survey	Dec-20	France	France	Researcher	To describe how general practitioners (GPs) adapted their practices to secure and maintain access to care in the epidemic phase.	Observational - quantitative analysis	General practice / family medicine
Shadmi 2020 [87]	Health equity and COVID-19: global perspectives	Jun-20	Multiple	China, Brazil, Thailand, Sub Saharan Africa, Nicaragua, Armenia, India, Guatemala, USA, Israel, Australia, Colom- bia, and Belgium	Researcher	To describe some of the approaches taken by governments and local organizations to address equity issues during COVID: 13 country case studies	Commentary / edito-rial	General practice / family medicine
Sigurdsson 2020 [88]	How primary healthcare in Iceland swiftly changed its strategy in response to the COVID-19 pandemic	Nov-20	Iceland	Iceland	Researcher	To describe how PHC in Iceland changed its strategy to handle the COVID-19 pandemic	Observational - narrative description only	General practice / family medicine

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Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
Smyrnakis 2021 [89]	Primary care professionals' experiences during the first wave of the COVID-19 pandemic in Greece: a qualitative study	Sep-21	Greece	Greece	Researcher	To explore the experiences of Primary Care Professionals (PCPs) about the preparedness and response of PHC to the first wave of the pandemic in Greece.	Observational - qualitative analysis	General practice / family medicine
Steeves-Reece 2021 [90]	Rapid Deployment of a Statewide COVID-19 ECHO Program for Frontline Clinicians: Early Results and Lessons Learned: Official Journal of the American Rural Health Association and the National Rural Health Care Association	May-20 USA	NSA	USA: Oregon	Other: Practice-based Research Network using Extension for Community Healthcare Outcomes (ECHO) framework (with some functional similarities to a PHN)	Describe program development and provide guidance for others in future health crises	Other: Program description	General practice / family medicine
Takita 2020 [91]	Geographical Profiles of COVID-19 Outbreak in Tokyo: An Analysis of the Primary Care Clinic Based Point-of- Care Antibody Testing	Jun-20	Japan	Japan	PC practitioner/clinician	Analysis of point of care antibody testing for COVID-19 in primary care clinics in Japan	Observational - quantitative analysis	General practice / family medicine
Thornton 2020 [92]	COVID-19: how coronavirus will change the face of general practice forever	Mar-20	England	England	Other: medical jour- nalist	Commentary on the changes COVID-19 has brought about in general practice	Commentary / edito- rial	General practice / family medicine
Tse 2020 [93]	Fighting against COVID-19: preparedness and implications on clinical practice in primary care in Shenzhen, China	Dec-20	China	China, Shenzhen	Researcher	To investigate the roles, preparedness and training needs of GPs in China in managing the COVID-19 outbreak.	Observational - quantitative analysis	General practice / family medicine
Tutor Marcom 2020 [94]	Working along the Continuum: North Carolina's Col- laborative Response to COVID-19 for Migrant & Seasonal Farmworkers	Sep-20	USA	USA; North Carolina	Other: Collaboration between clinicans, policymakers and NGO/service delivery organisations	Not stated - descrip- tion of collaborative intersectoral working group	Observational - narra- tive description only	Other: Multiple cross- sectoral agencies includ- ing PHC and community health centres (CHCs)

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Table 3 (continued)								
Study ID	Title	Date	Country	Jurisdiction	Author perspective	Aim of study / paper	Study design	PC setting
van der Velden 2021 [95]	Primary care for patients with respiratory tract infection before and early on in the COVID-19 pandemic: an observational study in 16 European countries	Jul-21	Multiple	Armenia, Belgium, Denmark, France, Georgia, Germany, Greece, Hungary, Ireland, Moldova, Netherlands, Poland, Romania, Spain, Ukraine, United Kingdom	Researcher	To describe PHC (consultation characteristics and management) for patients contacting their general practitioner (GP) with a respiratory tract infection (RTI) early on in the COVID-19 pandemic in contrasting European countries, with comparison to prepandemic findings.	Observational - qualitative analysis	General practice / family medicine
Wong 2021 [96]	A Tale of 3 Asian Cities: How is Primary Care Responding to COVID- 19 in Hong Kong, Singapore, and Beijing?	Jan-21	Multiple	China, Beijing, China, Hong Kong; and Sin- gapore	Other: Researchers and managers	Comparison of COVID- 19 response in three Asian cities: Hong Kong, Singapore, and Beijing	Observational - narrative description only	General practice / family medicine
Wright 2021 [97]	Will Community Health Centers Survive COVID-19?	Jun-20	USA	USA, North Carolina	Researcher	To describe the impact of COVID-19 on US Community Health Centres	Commentary / edito- rial	Other: Community Health Centres
Xu 2021 [98]	The Impact of COVID- 19 on Primary Care General Practice Con- sultations in a Teaching Hospital in Shanghai, China	Mar-21	China	China, Shanghai	Other: clinicians, researchers, and man- agers	To evaluate the impact of the COVID-19 pandemic on the pattern of primary care consultations within a Shanghai hai health district	Observational - quantitative analysis	General practice / family medicine
Yang 2021 [99]	Roles of Primary Care Doctors in COVID- 19 Pandemic: Level of Consistency Across Perceptions of Doc- tors and Experts and Impact Factors	Jan-21	China	China, Zhejiang Province	Researcher	To investigate the consistency of primary doctors and experts' perceptions of roles of primary doctors in COVID-19 containment, providing evidence for the development of targeted trainings for primary doctors and the determination of the roles of them in major public health events.	Observational - quantitative analysis	General practice / family medicine

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Table 4 Ten PC pressure points during COVID-19, arranged by theme

Demand for new ways of working	1. Rapid adaptation in a high-pressure environment
	2. Radical adoption of infection prevention and control (IPC) measures
Fluctuating community needs	3. Maintaining routine and preventive care
	4. Exacerbation of social determinants of health
	5. Emerging mental health issues for patients and workforce
Strain on PC resources and systems	6. Financial burden
	7. Workforce challenges
	8. Unmet resourcing & support needs
Ambiguity in health system interactions	9. Uncertainty & inconsistency
	10. Insufficient integration and planning

Table 5 Risks and requirements in transitioning to digital modalities

Remote consulting required a discrete and often unfamiliar skillset that could:

- manage and troubleshoot technology [32, 82, 84];
- develop PCPs' competence and confidence [70, 84];
- · alleviate patient anxiety [84];
- recognise and respond to patients' mental health issues [58]; and
- identify privacy issues such as for those at risk of domestic or family violence or abuse [58].

Maintaining service quality in the absence of physical contact was a new risk requiring attention and adaptation [28], that resulted from the inability to conduct physical examinations in virtual consultations [82], inaccessibility of usual point-of-care (POC) testing facilities [61], and lack of non-verbal cues when using the telephone [82]. Some patient groups required attention to specific needs such as communicating with culturally and linguistically diverse or hearing impaired patients [82, 84].

ability of people of low SES to access testing and care was severely restricted by out-of-pocket costs [26, 37, 42, 77, 87]. The synergistic effect of systematic inequalities and the pandemic, especially for those already subject to socioeconomic or clinical vulnerabilities, contributed to higher rates of clinical risk for COVID-19 and its sequelae (see Table 6) and ongoing pressure on PC services to respond to increased health needs.

Mental health issues in patients and workforce

Many studies described increased and unmet demand for community mental health services for patients impacted by the pandemic [20, 28, 33, 44, 54, 58, 63, 66, 97, 98]. The personal impact on PCPs was also considerable, with many experiencing mental health issues [29, 33, 44, 45, 74],

related to psychological stress [44, 74], exhaustion [29, 45], worry about infection [45, 74], increased workload [45, 74], anxiety and depression [33], and in some cases, feelings of isolation because of lack of contact with colleagues, and a sense of inadequate guidance from authorities [45].

Strain on PC resources and systems *Financial burden*

Many PCPs reported significant financial impact during the pandemic due to reduced volumes of face-to-face consultations [34, 36, 48, 54, 58, 62, 65, 82, 89], increased administrative requirements [58], and the cost of transitioning to virtual consultations and upgrading technological capacity [82, 89, 92]. Rapid transition to virtual consultations exposed the need for updates to regulatory

Table 6 Social determinants and syndemic effects of COVID-19

Disparities arose both directly from pre-existing social inequities resulting in disproportionate risk of acquiring COVID-19 and developing severe disease; and indirectly via flow on effects such as digital disadvantage contributing to differential access to care and inability to engage in virtual care modalities. [68] Examples included:

- greater clinical risk for multigenerational households in low income Canadian neighbourhoods [37].
- long-standing social inequities and health disparities among people from racial and ethnic minorities resulting in disproportionate effects of COVID-19 in both Oman and the United States (US) [27, 85].
- particular vulnerabilities for opioid drug users due to associated health and social risks increasing risk of COVID-19 infection in Ireland and the US [40, 54].
- people released from incarceration with complex health and social needs, and significant barriers to engaging with primary care, who often live in communal situations placing them at higher risk of COVID-19 infection and transmission to others [81].
- in Canada and the US, PCPs and patients living in rural areas experienced reduced access to virtual technologies [33] and disparities in service provision such as vaccinations. [69]

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and security standards which were no longer fit for purpose, especially those related to financial remuneration, eligibility of providers, and reporting [32, 58, 65, 72, 79]. In some countries, for example the US and Canada, remuneration systems with billing codes tied to in-person consultation services saw self-employed PC practices became financially unviable [28, 54].

Workforce challenges

Staff shortages and depleted workforce sustainability were an operational and financial pressure point [28, 29, 43, 63, 66, 75, 84, 89]. These resulted from the need to quarantine or furlough unwell staff or those exposed to COVID-19 [29, 66], selective loss of at-risk staff who chose to resign or take leave [84], burnout [29], and reassignment of PCPs to Greek secondary care facilities [89]. Business continuity was affected by staff layoffs in practices that could not financially sustain pre-pandemic staffing numbers [54, 65], and the need to offer financial incentives to attract and maintain staff under substantial workforce duress in the US [28]. Compounding these stressors was an increase in pandemic related workload [48, 56, 70, 74, 82, 84].

Unmet resourcing & support needs

The move to virtual consulting exposed serious infrastructure and technology constraints including for equipment, internet connectivity and access, and technology literacy [28, 32, 33, 58, 94, 100]. Lack of physical infrastructure was problematic for practice restructuring that required environmental controls to manage provision of space for segregation and infection control [48, 49, 78, 95], including provision of water and appropriate sanitation in some African countries [78]. The need for pulse oximetry was problematic in some European PC services with few, if any, suitable devices [95]. Ongoing management of Long COVID which continues to increase in prevalence, and where PC is well placed to provide integrated community management [58, 97], will require dedicated planning and resources. Supply and logistics challenges impacted on delivery of multiple services (see Table 7).

Ambiguity in health system interactions *Uncertainty & inconsistency*

Ongoing, often necessary, changes to PH decision making and changing epidemiological conditions created an environment of substantial uncertainty and instability. Inconsistent communication and inadequate guidance from central agencies were often reported, leaving PCPs with suboptimal clarity about the correct procedures and approaches to follow [45, 48, 54, 58, 64, 68, 73, 92–94]. Frequent modifications to advice [89], ambiguity about vaccination programs [55], and delayed implementation of quarantine policies [73], created confusion amid the need for constant review of emerging pandemic information [48]. Poor and confusing communication to the public about issues such as vaccination dosing in the UK were also noted [56], often obliging PCPs to translate and interpret critical information for patients.

Insufficient cross-system coordination

Fragmented leadership, unpredictable political responses, and lack of clear central guidance reportedly slowed pandemic responses [62, 68, 95], highlighting insufficient preparedness [46, 54, 101]. Limited attention to the role of PC in PH planning was noted in countries such as Canada [45], despite acknowledged need for comprehensive approaches that build cross-sectoral and publicprivate partnerships in others such as Oman [27]. PCPs reported ineffective communication and engagement with policy planners and a need for better integration and consideration of PC experience in future pandemic planning in Germany and Canada [48, 64]. However, PCPs' own views did not always align, or concur with jurisdictional guidelines [64, 99]. Included papers across multiple countries found little policy focused on clear roles or support for PC [54, 62], nor how to sustain PC in a prolonged health emergency [54].

Discussion

This analysis identified ten pressure points impacting on PCPs and PC services as they contributed to international health system responses to the COVID-19 pandemic. These pressure points clustered in four themes: the first two reflecting challenges created by changing

Table 7 Services affected by supply disruptions

Staff safety was sometimes compromised due to poor quality and compromised availability of PPE and lack of access to testing (UK); [68] shortages of other consumables, such as POC tests for COVID-19 [47, 83, 96], laboratory testing materials (US) [35], and hand sanitiser (France) [39], were also reported.

Testing capacity was often constrained by limited access to testing resources [68, 83, 96], and laboratory turnaround times [42] leading to long delays for test results [42, 83]; with clinical follow up after diagnosis not always available, even in the UK [52]. COVID-19 testing rates were also reduced due to the cost of testing [26] and people's distrust of the process [42] in the US and South Africa, respectively. Vaccination programs in PC experienced specific challenges including patient attitudes and vaccine hesitancy [20, 53], inadequate and uneven supplies [53, 55, 60], logistical problems for delivery to large decentralised populations in Canada [101], and cold chain maintenance [49, 101].

circumstances in the PC environment as a result of the pandemic; and the last two describing burdens imposed by the work required of PC services in response to the pandemic.

This review was among the first to synthesise multiple accounts to consider collective impact on PC systems as a result of the COVID-19 pandemic. A late 2020 scoping review of 32 studies from 18 countries identified reductions in capacity and quality of PC services, with effects on privacy, treatment relationships and delayed care; and deleterious effects of these disruptions on patient outcomes, especially for socially or economically vulnerable individuals, or those with existing comorbidities and mental health conditions [102]. Other early COVID-era studies identified implementation barriers for PC services including the impact of PH measures on PC functions, problems with multi-sectoral integration and governance, poorly managed risk communication, critical knowledge gaps, time and technology constraints, and limited recognition and support [4, 17]. Lessons from previous pandemics have been similar, highlighting the importance of clear, coordinated, reliable information, clearly delineating roles, improving cross-sectoral collaboration and protecting health workforce [103, 104].

Our findings are consistent with these accounts, while extending and building on them to accommodate evolving data and locate widely observed impacts on PC within a thematic framework of collective pressure points. This framework offers a structured approach for conceptualising the impact on PC during COVID-19 and informing future pandemic planning. While many of the challenges described in this study were not unique to PC, and were faced across health systems and throughout communities, these findings highlight the range of factors that should be addressed to acknowledge and facilitate the crucial contributions of PC to pandemic response. The ten pressure points outlined here provide a framework for conceptualising the ongoing impact of these COVID-19 contributions on PC services, and developing strategies to accommodate and mitigate these effects.

Emerging descriptive and experiential evidence resonates with these findings, highlighting additional PC workload [105], task changes [1], reductions in revenue and workforce availability [106], and shortages of resources such as medicines and PPE [107, 108]. Increases in COVID-19 related workload have been linked to heightened emotional states and reports of stress, frustration and mental overload [105, 109]; with PCPs describing personal psychological distress and reduced wellbeing, as well as concerns for their families [110, 111]. Some reported feeling overlooked, with inadequate recognition and remuneration [112], and frustrated by their inability to respond to non-pandemic health

concerns [107], as fixed resources necessitated trade-offs in response to changing demands [2]. Perceptions of suitable government support and recognition were important protective factors in the face of such distress [113], and will form important components of planning for PC responsiveness in future pandemic scenarios. A 2021 rapid review of virtual PC in high income countries identified the need for ongoing work to address shortcomings exposed by COVID-19 and support sustainability, despite existing policy supports [72]. Consensus principles for pandemic recovery [114] underline the importance of acknowledging contributions and supporting wellbeing as a prelude to integrated planning based on communication and trust [114].

Widespread transformation in PC, while generating work and necessitating adjustment, also brought the advent of new tools and innovative solutions [102, 115]. PC contributions became increasingly acknowledged and integrated as the pandemic evolved [22, 116], with many promising practices and creative solutions emerging, both from the PC sector and from policymakers [6]. Mitigation strategies included examples of PC creativity, resilience and resourcefulness [117], and support from external policy, financial and regulatory measures [6, 102]. Responses encompassed rearrangement of tasks between PC professionals; leveraging of digital tools and systems by new legislation, new telemedicine services, or new guidelines and regulations; patient education initiatives; and rapid introduction of add-on payments for PCPs facing both increased workload and risks, including for teleconsultation services and home visits or for hygiene and safety measures [6, 102].

Strengths and limitations

Strengths of this study are the systematic methods, the international orientation and illustrative synthesis, supported by a robust international team of experienced PC investigators able to interpret and validate findings. The study is limited by the exclusion of grey literature which may provide more expansive description of impacts on PC settings. It also reflects a period in time (January 2020-May 2021) during the initial phase of the pandemic and is neither an exhaustive nor ongoing account. This period of significant disruption placed PCPs under intense pressure that varied across time and place. These variations were unable to be comprehensively examined in this indicative, narrative analysis.

Conclusions

The pivotal role played by PC in short- and long-term responses to PH emergencies has been established previously [118, 119], and now clearly demonstrated during the COVID-19 pandemic. Notwithstanding the

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strengths and contributions of PC, this paper focuses on challenges in order to identify key issues that require attention as part of health system strengthening and future pandemic planning. The potential roles of PC in the pandemic context should be acknowledged, resourced and planned for in consultation with the PC sector, and the pressure points for PCPs and PC services should be clearly understood in order to minimise unnecessary burden and optimise health system responses.

Principal lessons for policy makers, planners, and public health professionals include the importance of: support and resourcing to facilitate physical and operational adaptation and role evolution, including policy support to ensure and maintain supply chains for critical supplies; conscious recognition of PC roles in enabling comprehensive community responsiveness, and identifying and responding to emerging health needs; appreciation of business and operational strain imposed by changes in health service delivery models; and providing consistent, clear public health guidance and information that acknowledges and incorporates PC with active and ongoing inclusion in planning and preparation. Given the identified impact of the pandemic on exacerbating the effects of social determinants of health and driving differential and inequitable effects for some population groups, both policy and clinical strategies to address these issues in future events will be essential. Use of panel registries that identify at risk groups will facilitate the mobilisation of resources to identify needs, mitigate risks and support timely access to prevention and care.

There are also lessons for PCPs and PC services. Much of the hard work to innovate and establish new processes and systems of care, for example electronic prescribing, has been done. Maintaining and documenting these will ensure PCPs and PC services are in good stead when future pandemics or crises occur, as will sustaining investment in the effort expended to upskill the PC workforce for new ways of working, particularly the use of virtual and remote consulting modalities. Further implementation research into the delivery of care in this way at scale, and impacts on quality and safety is needed, as is the integration of knowledge gained from the pandemic into current and future training pathways. For example, experiences with addressing challenges related to IPC measures, and managing risks associated with increased reliance on non-clinical virtual triage offer a rich resource for developing clinical protocols and tools, as well as educational modules that can be deployed in future events or used in ongoing quality improvement and professional development activities, to maintain workforce readiness.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-024-02640-w.

Additional file 1. Data extraction template: international primary care responses to COVID-19.

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Authors' contributions

SHD, JD, MK, DB & SD conceived the study questions and formulated the study design and methodology. All authors reviewed and approved the study protocol. SHD, AP, LB, LS, GMD, MW, JD, DB & WW screened studies and extracted data. SHD & AP managed and analysed data with input from JD & WW. SHD and AP drafted the main manuscript and prepared figures and tables. All authors reviewed analytical outputs and considered and contributed to the final manuscript.

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Data availability

All data generated or analysed during this study are included in this published article [and its supplementary information files], or available from authors on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable.

Competing interests

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Author detail

¹School of Medicine & Psychology, College of Health & Medicine, Australian National University, Canberra, Australia. ²National Centre for Epidemiology & Population Health, College of Health & Medicine, Australian National University, Canberra, Australia. ³Centre for Health Economics Research and Evaluation, University of Technology, Ultimo, Australia. ⁴Faculty of Medicine and Health, University of Sydney, Sydney, Australia. ⁵Department of Family Medicine and Primary Care Ap Lei Chau Clinic, University of Hong Kong, Hong Kong, China. ⁶Centre for Community Health and Wellbeing, The University of Queensland, Brisbane, Australia. ⁷School of Primary and Allied Health Care, Monash University (Peninsula Campus), Frankston, Australia. ⁸College of Health & Medicine, Australian National University, Canberra, Australia. ⁹Adjunct Lecturer, University of New South Wales, Sydney, Australia. ¹⁰Academic Unit of General Practice, ACT Health Directorate, Canberra, Australia. ¹¹Institute for Urban Indigenous Health, Brisbane, Australia. ¹²Australian Government

Department of Health and Aged Care, Canberra, Australia. ¹³Organisation for Economic Co-operation and Development, Paris, France. ¹⁴Department of Family and Community Medicine, University of Toronto, Toronto, Canada. ¹⁵Alliance for Health Policy and Systems Research, World Health Organization, Geneva, Switzerland. ¹⁶Special Programme on Primary Health Care, World Health Organization, Geneva, Switzerland. ¹⁷Centre for Future Health Systems, University of New South Wales, Sydney, Australia. ¹⁸Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, England.

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